

hydrocarbon-based solvent having a boiling point higher than that of the phenol used as a raw material and not containing an alcoholic OH group to an prepared reaction mixture to remove the unreacted phenol by distillation, dissolving the prepared distillation residue in an organic solvent not containing an alcoholic OH group under heating, and cooling to precipitate 9,9-bis(4-hydroxyphenyl)fluorene" (claim 1).

Regarding the catalyst, Takahashi describes that "conventional catalysts can be used as the catalyst. For example, a thiol compound such as β -mercaptopropionic acid and hydrogen chloride gas, a metal chloride and chlorine gas are used as the catalyst" (paragraph [0010]). Further, in all examples, the hydrogen chloride gas is used as the acid catalyst, and 3g of J3-mercaptopropionic acid are used relative to 100g of fluorenone (99.9wt%).

Regarding advantages of Takahashi, the specification states that "by adding the solvent having a boiling point higher to the condensed reaction mixture of fluorenone and the phenol, unreacted phenol can be recovered efficiently." (paragraph number [0025]).

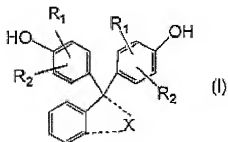
Shinagawa discloses "a method for producing 9,9-bis(hydroxyaryl)fluorene, which comprises subjecting fluorene and oxygen to reaction in the solvent having a high boiling point in the presence of a caustic alkali and a phase-transfer catalyst, and subjecting the resulting fluorenone and a phenol to reaction in an inert organic solvent in the presence of an acid and a mercapto carboxylic acid" (claim 1).

Regarding the catalyst, Shinagawa states that "the amount of β -mercaptopropionic acid as the co-catalyst is 0.001-0.01 equivalent weight relative to fluorenone. In the reaction of fluorenone with a phenol, the use of hydrogen chloride instead of sulfuric acid is publicly known. However, since the hydrogen chloride corrodes the equipment, the sulfuric acid is preferred commercially to the hydrogen chloride" (paragraph number [0014]). In all examples, concentrated sulfuric acid is used as an acid catalyst. Further, in Example 2, 9,9-bis(4-hydroxy-3-methylphenyl)fluorene is prepared.

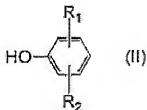
Regarding advantages of Shinagawa, the specification states that "by using an aromatic hydrocarbon solvent having a high boiling point as the solvent in the production process of fluorenone, the experimenter can work in safety. By using the inert organic solvent in the

production process of 9,9-bis(hydroxyaryl) fluorene, the amount of a phenol can be reduced and reduction in cost can be realized" (paragraph [0024]).

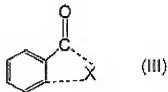
Fennhoff discloses "a process for preparing bisphenols corresponding to the formula:



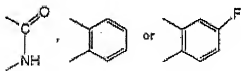
the process comprising reacting phenols corresponding to the formula:



with ketones corresponding to the formula:



wherein R1 and R2, independently of one another, denote hydrogen, halogen, C1-C8 alkyl, C5-C6 cycloalkyl, C6-C10 aryl or C7-C12 aralkyl, and X represents



in the presence of a catalyst and a cocatalyst, the catalyst comprising a mineral acid, and the cocatalyst comprising a sulphonic acid ion-exchange resin based on a cross-linked polystyrene, wherein the ion-exchange resin includes acidic groups having been previously neutralized to an extent of at least 10% by weight by mercaptoamines, thiazolidines, or a mixture thereof” (claim 1).

Fennhoff states that “the mineral acid used is preferably a mixture of 36% hydrochloric acid and hydrogen chloride gas. 1 kg of 36% hydrochloric acid and 1 kg of hydrogen chloride gas are used per 18 to 180 mol of a ketone (III) . Hydrogen chloride gas is particularly preferably used without hydrochloric acid” (column 3, lines 46-50).

Fennhoff further states, as an advantage, that “bisphenols corresponding to formula (I) can be prepared without difficulty ... with high conversions of ketone and very high selectivities of 90% to 100%, complete conversion of the ketone being attained after shorter reaction times than is the case where the corresponding cocatalysts such as mercaptans are used in the homogeneous phase” (column 2, lines 54-65).

All of these cited references fail to disclose using a mercaptocarboxylic acid in combination with a hydrochloric acid aqueous solution in a larger amount compared to the conventional amount of the catalyst, as recited by Applicants’ claims. In particular, the cited references never disclose using hydrochloric acid of 0.1 to 3 times by weight (in terms of hydrogen chloride) relative to the mercaptocarboxylic acid, and additionally using the mercaptocarboxylic acid in a proportion of larger amount than the conventional catalyst amount relative to fluorenone, as recited by Applicants. All of the cited references do not disclose the combination of the aqueous hydrochloric acid solution and the mercaptocarboxylic acid, as recited by Applicants. Accordingly, the specific ratio of the hydrochloric acid aqueous solution relative to the mercaptocarboxylic acid would not be motivated from the references.

Further, Takahashi and Fennhoff use the hydrogen chloride gas as the acid catalyst. Shinagawa uses the concentrated sulfuric acid as the acid catalyst. Accordingly none of these references are able to produce a high yield, pure and transparent product that results from Applicants’ claimed invention. Further, the present effects by the combination of the

mercaptocarboxylic acid and the hydrochloric acid, as recited by Applicants', are not predicted by the references using the hydrogen chloride gas or the sulfuric acid.

Contrary to the teaches of the cited references, employing the mercaptocarboxylic acid in combination with the hydrochloric acid aqueous solution, which is used in a larger amount compared to the amount of the catalyst usually employed, a fluorene derivative of high purity and transparency can be obtained at a high yield, as with Applicants' claimed invention.

Incidentally, the Examiner points out that the adjustment to reactant concentrations is known in the art and absent unexpected results or evidence to the contrary. Therefore, Applicants conducted the experiments for clarifying the effectiveness of the present proportion (weight ratio) of the mercaptocarboxylic acid relative to hydrogen chloride [the mercaptocarboxylic acid/hydrogen chloride] and thus we submit the results of the experiments in the attached Declaration. As apparent from the results of the Declaration, the fluorene derivatives of Examples 1, A and B are obtained by the proportion (mercaptocarboxylic acid/hydrogen chloride) ranged from 1/0.1 to 1/3, and the fluorene derivatives have high yield and low "b" value. On the other hand, the fluorene derivatives of Comparative Example A (obtained by the proportion less than 1/3) and Comparative Example B (obtained by the proportion more than 1/0.1) have low yield and high "b" value. In detail, the yields of the fluorene derivatives of Examples 1, A and B are over two times higher than that of the fluorene derivatives of Comparative Example A and B, and the "b" values of the former are below half lower than that of the latter. That is, these data prove that unexpected advantages are obtained by the method of the present invention, as recited by Applicants' claims.

Thus, for at least the above cited reasons, Takahashi, Shinagawa and Fennhoff fail to disclose all of the elements recited in Applicants' claimed invention. Further, the Takahashi, Shinagawa and Fennhoff fail to provide a basis to establish obviousness under additional rationales, including simple substitution for one known element for another to obtain predictable results, use of known technique to improve similar device in the same way, applying a known technique to a known device ready for improvement to yield predictable results, obvious to try, or the presence of a teaching, motivation, or suggestion. Thus, reconsideration and withdrawal from this rejection, and allowance of all claims is respectfully requested.

Conclusion:


All matters having been addressed and in view of the foregoing, Applicants respectfully request the entry of this Amendment, the Examiner's reconsideration of this application, and the immediate allowance of all pending claims.

Applicants' representative remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this matter. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 24-0037. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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